THE VETERINARY RECORD

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888.

No. 15. APRIL 10, 1943 VOL. 55

The Poisoning of Livestock by Cacao Products*

F. BLAKEMORE, M.R.C.V.S., D.V.S.M.,

and

G. D. SHEARER, PH.D., B.SC.,

INSTITUTE OF ANIMAL PATHOLOGY, UNIVERSITY OF CAMBRIDGE

During 1941 several outbreaks of poisoning amongst pigs and poultry were brought to our notice and in each case it was found that the losses followed the feeding of meals containing cacao products. In fowls the condition was characterised by sudden death within 48 hours after feeding the food and in certain instances the death rate was considerable. The birds which did not succumb appeared healthy, but the owners stated that the flocks consumed an increased amount of water. On two farms the feeding of food containing cacao products to pigs was followed by inappetence, but the condition was transitory and the animals recovered when the food was changed.

Poisoning by cacao products has been reported in the literature on a number of occasions and the toxic effect is known to be due to the presence of theobromine. The theobromine content of two samples of meal issued for poultry feeding was determined; one was found to contain 0·41 per cent. and the other 0·5 per cent. It was also possible to obtain samples of cacao meal and cacao residues used for making up the compound meal. The former contained 1 per cent. theobromine and the latter 1·9 per cent., indicating that the products formed a large proportion of the feeding-stuff.

In a preliminary feeding trial three fowls were allowed an unlimited amount of meal containing 0·5 per cent. theobromine. One of the birds died within 48 hours and the other two remained normal. An experiment was then conducted in which three cockerels were fed with weighed amounts of the food. One died within 36 hours after consuming 3 oz., but the other two each ate 5 oz. in three days without suffering any apparent ill effect. While these experiments were not extensive the results indicated that the meals were toxic to a percentage of the fowls consuming the food.

The use of cacao products as feeding-stuffs for animals.—Cacao products are essentially a by-product of the industries producing cocoa and cacao butter. During the manufacturing process, according to Thorpe's "Dictionary of Applied Chemistry" (4th Ed.), the seeds of the cacao tree are fermented, roasted and cracked and the husks and small fragments of kernel are removed from the relatively unbroken kernels. The former are sold as cattle food while the kernels are pressed to obtain cacao butter, leaving a residue which is ground to give domestic cocoa powder. The production of cocoa and cacao butter is therefore complementary, but owing to the increased demand for the latter, the beans are often compressed primarily for the fat and the residue is sold as cacao meal for cattle feeding. In some cases the beans are not shelled before crushing but pressed for fat, so that the cacao meal contains the husks.

Analyses of samples of cacao meal from the manufacturers were made by Asplin and Ellenberger (1927), who found the percentage composition to be as follows:—

Moisture	2½– 6½
Total dry matter	93¾–97½
Crude ash	5 – 7
Crude protein	22 –26½
Crude fibre	2 – 7
Nitrogen-free extract	42½–47
Fat	11 –23 (usually 14-18).
Theobromine	1 – 3 (usually 2).
Caffeine	0·2–1·2 (averaging 0·75).

The theobromine content of the husks varies considerably, depending on the variety of the cacao bean and on the amount of fermentation. In the unfermented bean the theobromine is mainly concentrated in the kernel and the amount in the husk is small (*e.g.*, 0·19 per cent.), but during fermentation there is a diffusion from the kernel and the husk content rises, so that with highly fermented beans the value may reach 2·98 per cent. The value of about 1 per cent. is perhaps a fair average (Golding & Burr, 1937).

Evidence regarding the toxicity of cacao products.—Marchadier & Goryon (1919) found that seven army horses were killed by the daily addition for four days of 1·5 kilos of cacao husks to their oats. Analyses of the husks indicated an alkaloid content of 0·18–0·20 per cent. caffeine and 0·66–70 per cent. theobromine, so that in the four days the animals had taken in up to 54 grammes of total alkaloid. The authors concluded that the alkaloid bases of cacao husks are dangerously toxic and that the food should not contain more than 5 grammes a day if given to horses.

These results were confirmed by Fonzio and Darcon (1920), who found that horses manifested violent excitement as the result of the daily ingestion of about 700 grammes of cacao husks, containing about 0·7 per cent. theobromine. Winkler (1938) found that cacao husks fed daily to working horses in amounts up to 8 to 14 kilos per 1,000 kilos live weight caused no ill effect. The performance of the horses fed with cacao was the same as that of those fed with oats. As the test horses became accustomed to it, 2 kilos of cacao husks were substituted for 1 kilo of oats.

Asplin and Ellenberger (1927) found that when cacao meal was fed to milking cows the fat content was increased but the total yield became reduced so that the net gain in fat production was small. The cows were given up to 3 lb. of the meal a day on their ration for five days, but the experiment was not continued for a longer period as the cows began to go off their feed.

Asplin (1927) found that cacao meal was not a suitable ingredient for pig rations. He considered that it was not palatable and caused litters of weak, undersized pigs when fed to pregnant sows. Growing pigs which were fed on a ration containing 15 per cent. of cacao meal received over five times as much meal for a pound of gain as did the control batch.

Fangauf and Haenfel (1939) found that the addition of 20 per cent. of cacao meal to the ration of laying Leghorn fowls during a period of four months resulted in a decrease of food consumption, in the number and weight of the eggs and in the weight of the fowls. Griffiths (1921) reported a high mortality in ducks when fed on mash containing cacao meal.

Conclusions

There would appear to be ample evidence that cacao husks and meal are liable to have a toxic effect on animals when fed in quantity. Horses, swine and poultry are evidently particularly susceptible. The toxic effects produced by feeding cacao shells or meal are due to the presence of theobromine. Moreover, these products do not seem very acceptable to animals and are evidently not taken very well when first mixed with the food. Since theobromine is present in varying amounts in cacao products depending on previous treatment, etc., it is suggested that neither cacao husks nor meal should be fed to farm animals without previous analysis and in any case should not be given in quantity.

Acknowledgment.—The authors gratefully acknowledge the assistance given by Dr. and Mrs. Kilby, of the Physiological Laboratory, Cambridge, especially in connection with the literature regarding theobromine poisoning.

References

ASPLIN. (1927.) *Vermont agric. Exp. Sta. Bull.*, **273**, 1.
ASPLIN & ELLENBERGER. (1927.) *Vermont agric. Exp. Sta. Bull.*, **272**, 1.
FANGAUF & HAENFEL. (1939.) *Bull. Off. inter. cacao. chocolat*, **9**, 183.
FONZIO & DARCON. (1920.) *Ann. fals.*, **13**, 34.
GOLDING & BURR. (1937.) **14** (pt. 1), 44.
GRIFFITHS. (1921.) *Agric. Gaz., N.S.W.*, **32**, 55 and *Bull. imp. Inst., Lond.*, **19**, 214.
MARCHADIER & GORYON. (1919.) *J. Pharm. Chim., Paris*, **20**, 209.
WINKLER. (1938.) *Biederm. Zbl.*, **10**, 21.

WEEKLY WISDOM

The first farmer was the first man, and all historic nobility rests on possession and use of land.—Emerson.

* * * * *

In view of the gravity of foot-and-mouth outbreaks and the difficulty of ensuring that food waste is boiled by users before it comes in contact with stock, Edinburgh Corporation has decided to introduce processing plant in the city. The Inspector of Cleansing reported that the city's collection of food waste at present amounted to 500 tons per month, and an arrangement was approved whereby the Ministry of Supply should assist the Corporation by erecting the plant and building. The Corporation will pay 10s. per ton on processed food, which will enable the debt to be redeemed in three years.

* Presented to the Eastern Counties Division, N.V.M.A., at Colchester, October 22nd, 1942.

Observations on the Feeding of a Cacao Waste Product to Poultry

D. J. G. BLACK *and* N. S. BARRON

Early in the war a good deal of attention was paid to substances previously regarded as either waste or of doubtful value for stock feeding. Amongst these the cacao bean (*Theobroma cacao*) and its products created a good deal of interest. There are a number of different cacao products and, as some confusion appears to exist regarding them, the following brief account may prove helpful.

When the outer coat of the bean is removed and ground, it is usually referred to as cacao shell or husk meal. The remaining kernel or nib, as it is called technically, is rich in oil, which may be extracted either by pressure or by a solvent. The residue after oil extraction by pressure is referred to as cacao cake or if ground as cacao cake meal. After extraction by a solvent the residue is known as cacao powder. Sometimes the oil is extracted by crushing the whole bean and the residue in this case is described as undecorticated cacao cake or meal.

The difficulty of differentiating between these various products is aggravated to some extent by the fact that mixtures of them appear to be available at the present time.

The cacao bean contains theobromine (dimethyl purine), which is toxic to domestic animals. It occurs in varying amounts in the different cacao products.

Hansen, in 1915, supplied evidence relating to the toxicity and chemical composition of cacao cake and cacao shell. (See Table I.)

TABLE I

	Cacao Cake (Hansen)	Cacao Shell Meal (Crowther)	Cacao Shell (Hansen)	Cacao "Shell Smalls" used in trials reported
Water	9·7	11·0	9·0	10·04
Crude protein ..	18·8	15·0	16·0	17·90
Crude fat	11·6	6·0	8·3	13·93
N. Free Extr. ..	37·8	46·0	46·0	40·17
Crude fibre	15·3	15·0	13·5	9·34
Ash	6·8	7·0	7·2	9·62
Theobromine ..				1·70

According to Hansen the theobromine content of the cacao bean is from 1 to 2 per cent. and that of the shell from 0·5 to 0·8 per cent. He also states that during roasting of the beans at 230° C. sublimation of the theobromine sometimes occurs and this may lead to a transference of the drug from the bean to the shell. On account of the high theobromine content of foods containing cacao preparations, these are apt to be very bitter and tend to be unpalatable to stock. From feeding trials and from evidence available at that date Hansen reached the conclusion that both the cake made from the ground beans and the shell were unsatisfactory as animal food. In trials with hens he used the actual toxic principle theobromine instead of cacao fodder and concluded that the equivalent of 35 grammes of cacao cake (containing 1·5 per cent. theobromine) was lethal to hens.

Despite the conclusions of Hansen[1] and others[2, 3] cacao bean products were incorporated in feeding-stuffs of various kinds soon after the outbreak of this war. Early in 1941 disturbances and losses through feeding cacao bean meal became so serious that Woodman[4] considered it advisable to issue a warning and some notes on its use.

In view of difficulties encountered by the authors in feeding cacao products to poultry, it was decided to record a typical experience in the field and the results of a small feeding trial in which varying levels of a cacao waste product were included in an all-mash ration for laying hens.

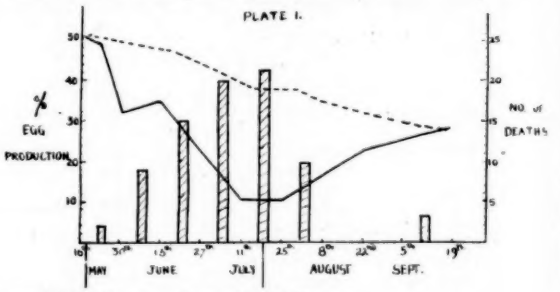
The material used both in the field and in the trial was a reddish brown substance consisting mostly of shell with a small amount of meal and is usually referred to by the trade as "shell smalls." The chemical composition of this material differs somewhat from that of the cacao shells given by Hansen[1] and Crowther[5]. It will be noted its theobromine content was 1·7 per cent. (See Table I.)

Field Experience

The most interesting case encountered was in late May, 1941. During a spell of very hot weather inexplicable losses began to occur in a flock of approximately 300 hens on free range which were receiving an all-mash ration. In view of the symptoms observed and the absence of any definite lesions on *post-mortem* examination, deaths were, in the first instance, attributed to sunstroke. Although the mash was purchased ready mixed, the poultry farmer was at first confident that it was not the cause of the trouble. Later, however, as egg production decreased and losses continued, the composition of the mash was investigated. It was then discovered that the only abnormal ingredient in the ration was a cacao preparation, and this had been included at the rate of 15 per cent. from the middle of May onwards.

The accompanying graph, Plate I, gives the percentage egg production from the flock of birds in question.

PLATE I.



Cacao Shell Mixture fed at 15% Cacao Shell Mixture fed at 7½%

—— % Egg Production with Cacao Shell Mixture.
- - - % Egg Production without Cacao Shell* Mixture.
No. of Deaths over fortnightly intervals.

* Average of three previous seasons.

As a rough basis for comparison the average percentage egg production on the farm for the previous three years is also shown. The numbers of deaths over fortnightly periods are indicated in the shaded histograms. The graph covers a period extending from May 16th to September 19th in the year 1941, and clearly shows the marked fall in egg yield which occurred when cacao shell was first fed and which continued until the middle of July, when the lowest egg production level was reached. On reducing the percentage of the cacao shell from 15 to 7½ on July 18th the egg production rose again, following a short lag period. It took two months, however, before the normal level of egg production was again reached. In all, 80 birds died and from the symptoms observed it can be assumed that all succumbed as a result of poisoning by the cacao preparation.

Symptoms

The hens that succumbed were always in full production and first-class condition. Death occurred suddenly and appeared to be precipitated by increased nervous excitability. For example, many birds died immediately following their release from the houses in the morning, as they were rushing to the food or water trough. The lethal effect of theobromine thus appears to be delayed, and in this connection it is interesting to note that Woodman[4] considers that theobromine tends to accumulate in the body, since, in his experiments, the rate of intake exceeded the rate of elimination, and when a certain level is reached symptoms of poisoning develop with alarming suddenness.

The affected birds died in convulsions, often leaping into the air, finally assuming a characteristic position, lying on their backs with their legs tightly drawn against their bodies. The comb frequently showed a marked bluish tinge and the cloaca was violently everted as though in an effort to expel faeces.

Post-Mortem Appearances

On opening the carcase the organs appeared generally congested, the liver especially being of a deep mahogany colour. The kidneys showed perhaps the most characteristic changes, being usually markedly mottled. Otherwise no significant changes were detected.

Histological Changes in the Kidney

Sections of kidney were prepared and stained with haematoxylin and eosin. The following changes were observed:—

1. Engorgement of the capillary tufts.
2. Thickening of the capillary walls.
3. Small round-celled infiltration into the interstitial region.
4. Lobation of the glomeruli, with retraction and exudation into Bowman's capsule.
5. The epithelium of the tubules showed cloudy swelling, with pyknosis of the nuclei.
6. Casts in the tubules, the ascending limb of the loop being more extensively affected. There was fragmentation and degeneration.

These observations indicated the presence of a subacute glomerulo-nephritis.

Table II

Group	Treatment	Hen No.	No. of Days Alive	Gain or Loss in Weight Lbs.	Gain or Loss in Weight Ozs.	Eggs Produced before Moulting	No. of days out of production, including Moult	Eggs produced after Moulting	Total Food Consumed to Death Lbs.	Total Food Consumed to Death Ozs.
A	30 per cent. cacao shell prep.	4	25	— 0	9	1	Dead	0	3	0
		8	75	— 1	8	0	Dead	0	5	0
		12	35	— 0	14	1	Dead	0	4	5
B	15 per cent. cacao shell prep.	3	200	+ 0	7	4	90	18	54	0
		7	120	— 0	4	1	Dead	0	28	0
		11	60	+ 0	1	9	Dead	0	14	0
C	7½ per cent. cacao shell prep.	2	200	+ 1	5	2	110	15	56	5
	..	6	200	+ 1	3	3	148	10	53	7
		10	200	+ 1	2	4	138	12	55	10
D	Control. No cacaoshell prep. ..	1	200	+ 1	8	0	180	0	59	4
	.. .. ..	5	200	+ 1	5	8	108	18	55	2
	.. .. ..	9	200	— 0	2	7	100	20	56	4

Feeding Trial

Subsequent to experiences similar to that described a small feeding trial was started in the beginning of August, 1941, in which the type of cacao product, of the composition already referred to in Table I, was fed at different levels to four groups of three fowls each. It was incorporated with the mash which was fed in a dry state to birds housed in individual cages in a battery.

For this trial twelve pullets were taken from the farm flock which had been receiving the cacao product in their mash for some months previously. The change in environment at this time of year unfortunately soon caused most of the birds, after laying a few eggs, to go into moult. This entailed extending the time of the trial to 200 days to allow the birds to come into production again. The results of the trial are given in Table II.

Under war-time conditions it was not possible to use more birds for trial. It will be noticed that the birds in Group A receiving 30 per cent. of cacao shell mixture in the ration died in from 25 to 75 days after the commencement of feeding and that the amount of food consumed was extraordinarily low, a factor which can be attributed to the lack of palatability of the dry mash. Marked scouring was observed and the birds suffered from intense thirst.

In Group B (15 per cent. cacao shell mixture) only two birds died, after 60 and 120 days respectively, the remaining hen surviving the trial. Symptoms similar to those observed in Group A were again observed though they were somewhat less severe. All the birds in Group C (7½ per cent. cacao shell mixture) survived the experiment and consumed a normal amount of food as compared with the controls. The droppings were, however, observed to be rather looser than normal, but despite this the birds gained in weight.

All the birds in the control Group D (no cacao shell mixture) looked fitter than those of Group C and, with the exception of bird No. 1, came through the moult rather more quickly.

Summary and Discussion

It would appear that the tolerance of individual birds varies considerably. The results may also be affected by the higher level of intake of the toxic principle in the case of Group A. Owing to the low food intake of this group and consequent weakened state, it seems likely that they succumbed more easily. There seems to be some indication that if the toxic principle is gradually introduced birds can deal with it up to a limited amount, but if the intake is high and accumulation occurs then symptoms of poisoning become apparent.

The toxicity of cacao bean products appears to depend entirely on the theobromine content and it is essential to establish this before deciding what amounts, if any, may be fed without detrimental results. Amongst cacao products those containing the highest proportion of shell are likely to have the lowest theobromine content. Thus products containing a low proportion of shell mixed with ground kernel are likely to be much more dangerous than the " shell smalls " used in the circumstances recorded above, which had a theobromine content of 1·7 per cent.

The results indicate that the feeding of 15 per cent. and upwards of this material was extremely harmful to laying birds, decreasing appetite and egg production, causing scouring and high mortality. The incorporation of 7½ per cent. of the material did not cause such harmful effects, but its use at this level cannot be regarded as safe and no advantage was observed by feeding it. It is doubtful if it had any nutritional significance and in view of its poisonous properties and lack of palatability it is not to be recommended for feeding to poultry.

It is possible that after the removal or neutralising of the theobromine, cacao products may have some value for feeding to poultry, but in order to establish whether this is so further trials are necessary.

Acknowledgments.—We should like to thank Mr. A. E. Martin, of the Department of Agricultural Chemistry, University of Reading, for carrying out the chemical analyses of the cacao product used and Miss Brazier, who was responsible for the practical work involved in attending the birds and keeping records.

References

[1]Hansen, C. H. (1915.) *Ber. K. Vet. og. Lanbohogskole Lab. Landskonon Forsog* (Copenhagen), **89**, 38.
[2]Fangauf, R., & Haensel. (1938.) *Arch. Geflügelk.*, **12**, 54-89.
[3]Wedeman, W. (1939.) *Z InfectKr. Haustiere*, **54**, 77-86.
[4]Woodman, H. E. (1941.) *J. Minist. Agric.*, **48**, No. 1, June, 45-46.
[5]Crowther, J. (1936.) *J. Minist. Agric.*, **43**, No. 7, Oct., 684.

The Farm Livestock Emergency Service*

Duties of Veterinary Surgeons and Animal Stewards when Bombs Containing Phosphorus or Other Poisonous Substances Have Been Dropped During an Air Raid

1. General

During an air raid bombs containing phosphorus may be dropped on or near farm buildings and in fields or crops; they are generally used for smoke screening or incendiary purposes. Apart from the direct damage, pastures, growing crops, corn, hay or straw in ricks or in buildings, and stored feeding-stuffs or drinking water may be made poisonous.

2. Types of Bombs Whose Contents may be Injurious to Cattle

The types and contents of bombs used by the enemy change from time to time so that it is not possible to give an account of them all, but it may be helpful if reference is made to some of those that are known to have been dropped, and to state what steps should be taken to avoid the poisoning of animals, and when animals are known to be suffering from poisoning what action should be taken.

Among bombs dropped are phosphorus oil bombs containing a black, extremely sticky liquid which is scattered when the bomb explodes. Another type contains phosphorus dissolved in some inflammable liquid, or again sheets, blocks or leaves of some inflammable substance such as rubber may be coated with it. All of these normally ignite spontaneously. Some of the phosphorus may fall on a wet surface or even into water, in which case it would not ignite. Unless dealt with, not only may a fresh outbreak of fire occur at a later date, but if parts of the phosphorus are carried away on boots or on the hoofs of animals it is likely to be ignited by friction at any temperature. An additional danger arises from the poisonous properties of the phosphorus mixture which may thus affect animals eating contaminated grass or other crops outside, or coming in contact with contaminated food-stuffs and fodder indoors. Generally speaking animals become poisoned through eating unignited portions of the phosphorus which have fallen into fodder or on to damp grazings.

3. Recognition of the Presence of Phosphorus

When a bomb containing phosphorus explodes, there are usually certain characteristic features which make its presence easily recognised. Unignited phosphorus exposed to the air fumes and glows with a distinctive green colour. This cannot be seen in daylight,

* F.L.E.S./L/4.

but it is strikingly evident in the dark. The glowing phosphorus also emits a smell reminiscent of burning matches. It may be masked by rubber and sulphur smells, but it will persist for days after these casual odours. When it burns there is a dense white smoke which is easily recognised by its acrid smell.

4. Action After an Air Raid

After an air raid the following precautions should be taken:—

(i) Find out whether bombs containing phosphorus or other poisonous substances have been dropped in fields, farmyards or other places to which farm animals have access.

(ii) If the presence of poisonous substances is suspected all animals should at once be removed or prevented from gaining access to the contaminated area, and the Veterinary Surgeon should immediately be called in.

(iii) The Animal Steward and his helpers should, however, as far as possible remove all traces of the poisonous substances by washing, brushing or scrubbing.

(iv) Where animals are injured Animal Stewards will notify the Veterinary Surgeon at once as set out in F.L.E.S./L/1.

(v) Contaminated animals should not be put into an uncontaminated field until all traces of the poisonous substances have been removed from such animals.

(vi) Since poisoning may not be apparent for many hours, the animals should be kept under observation for at least two days.

(vii) Traces of poisonous substances should be cleared from fields, crops, feeding-stuffs and buildings, special care being taken to see that none remains in holes and cracks in floors and walls.

(viii) All contaminated material should be burned or buried.

(ix) All food-stuffs in the contaminated area should be inspected by the Veterinary Surgeon and declared fit for use before being fed to livestock. Buildings and pastures from which contaminated animals have been removed should also be declared clear by the Veterinary Surgeon before being used again.

5. Protection Against Injurious Properties of Phosphorus

Although phosphorus itself is poisonous its smoke is not markedly so in the open. It should not be inhaled for long periods or in high concentrations, *e.g.* in enclosed spaces where there is dense phosphorus smoke. In dealing with such cases respirators should be worn. Care should be taken to avoid getting the face and hands splashed by any liquid containing phosphorus. When handling material contaminated with phosphorus rubber gloves should be worn, though leather gloves will give some protection. If gloves are not available keep the hands wet.

6. Fire

Phosphorus is rendered harmless (from the fire risk point of view) by immersing it in water.

7. First Aid Measures

(i) *Symptoms and effects.* Animals grazing on land contaminated by phosphorus bombs or shell may become affected. Sheep so poisoned have shown signs of uneasiness, mucous discharge from the nose, intense thirst and swelling of the abdomen. Damage arises from burning phosphorus and also from the corrosive action of the combustion products of phosphorus. No generalised effects upon the animals occur from absorption provided that oil is not used in treatment.

(ii) *Immediate treatment.* This consists of quenching the flame and removing the remaining phosphorus and its products after rendering them inert.

(*a*) Quench the flame with water. If this is not available use sand or earth.

(*b*) Cover the wet surface with powdered bicarbonate of soda. Work it into a paste and wash off.

(*c*) Swab with a 1 per cent. solution of copper sulphate.

Repeat alternately treatments (*b*) and (*c*), rubbing thoroughly into the burned area, changing the swabs frequently and continuing treatment for 20 to 30 minutes, then allow to dry. If the area catches fire again upon slight rubbing the treatment must be repeated. Treatment will obviously be facilitated by cutting the surrounding hair.

(iii) *After-treatment.* This is the same as for ordinary burns, but neither ointments nor greasy dressings may be used until all traces of phosphorus have been removed.

(iv) *General.* Care should be exercised when treating phosphorus burns and the hands should be kept wet.

29, Tavistock Square,
London, W.C.1.
April, 1943.

Speaking at Cambridge, the Minister of Agriculture, Mr. R. S. Hudson, said County War Agricultural Committees had been asked to devote considerable attention to the breeding of better cattle for milk and for beef. Far too many bad calves were being born. The choice of bulls was all-important.

CLINICAL COMMUNICATION

Some Observations on Stilboestrol Dipropionate in the Treatment of Anoestrus

G. S. ALLEN, M.R.C.V.S.
Honiton

Introductory.—In view of the present interest in the use of stilboestrol dipropionate and the conflicting results recorded by different observers, it was decided to keep records of all cases of anoestrus so treated over a period of some months in general practice.

It will be noted that almost all treatments were performed in the winter months during the season when oestrus is most difficult to observe and the results obtained may be due, in part, to the prevailing mild conditions in Devonshire at the time.

Dosage and Reactions.—The dose was administered by the intramuscular route and varied from 10 mgm. (small Guernsey heifers) up to 20 mgm. (large heifers and cows). The reaction varied from nil to a very pronounced oestrus with considerable sexual excitement lasting some days.

These dosages were based on the table given by Montgomerie and Brownlee* and the writer's observations have been that they are rather high, tending to cause very pronounced sexual excitement. It remains for further observations to show whether a smaller dose would still produce effective results.

Oestrus usually occurred two or three days after injection and the longest interval noted was eight days.

When no oestrus was observed for a month or more after injection it was assumed that the stilboestrol was ineffective, as many other factors (*e.g.*, nutritional, due to spring herbage) may have intervened.

In all the recorded cases treatment was confined to stilboestrol (B.W.) unless otherwise stated. The owner was instructed to have the animal served at the second oestrus following the injection.

Case Records

Case 1.—Guernsey cow; one calf in March, 1941.

Case 2.—Guernsey cow; two calves. Last calf August, 1941. These were two identical cases and are considered together. Both had a cystic enlargement of the left ovary, which was ruptured per rectum, and each received 10 mgm. stilboestrol on November 12th, 1941, both cases showing violent oestrus on the 14th, which lasted about six days.

Case 1 did not hold to services on December 3rd and 24th, 1941, and was given a uterine irrigation of Lugol's iodine on January 16th, 1942, when again in oestrus; she was served again on February 7th, 1942, and became pregnant. Case 2 became pregnant following her first service early in December, 1941.

Cases 3, 4, 5.—Three Devon-cross maiden heifers, which had never been in oestrus. In each case the ovaries were small and smooth (the so-called "dead" anoestrus). Each heifer received 10 mgm. stilboestrol on December 16th, 1941, oestrus appearing on the 19th and lasting some days. All three returned on oestrus at three-week periods and were served, but did not hold. The bull was then suspected of sterility and at the end of March all three were served by another bull. Cases 4 and 5 were diagnosed about ten weeks pregnant on June 15th, 1942. They subsequently calved on December 31st, 1942, and January 1st, 1943, respectively.

Case 3 received a uterine irrigation on June 22nd, 1942, before holding to service on July 12th, 1942.

Cases 6, 7, 8, 9.—Four maiden Guernsey heifers. The writer was requested to examine a group of eight heifers which did not display oestrus. They were in very poor condition and stunted in growth and the owner was informed that the trouble was probably nutritional in origin. However, four of the best were selected and each received 10 mgm. of stilboestrol on January 12th, 1942. No oestrus was observed in any of them.

Cases 10, 11, 12.—Three Devon-cross maiden heifers in rather poor condition but not undersized. Each was given 10 mgm. of stilboestrol on January 29th, 1942; no reactions were observed following treatment. They were then sold away, but were reported to have commenced showing oestrus about June-July, 1942.

Case 13.—Jersey cow, history unknown, multigravida. Examination revealed a corpus luteum in the left ovary, the cow being non-pregnant. 10 mgm. stilboestrol on February 6th, 1942, produced oestrus on February 9th, and about three weeks later the cow was served and became pregnant.

Case 14.—Devon cow, one calf, date unrecorded. Very careful observations were made on this animal to ascertain whether ovula-

* Montgomerie and Brownlee. *Vet. Rec.* **53**. 567.

tion occurred at the induced oestrus following the injection of stilboestrol. Examination on three occasions before treatment: *viz.*, February 10th, 1942, March 3rd, 1942, and March 12th, 1942, showed small smooth hypoplastic ovaries without occurrence of cyclic changes. 15 mgm. of stilboestrol on March 12th, 1942, produced oestrus on March 16th, on which day a few Graafian follicles could be palpated in both ovaries. Oestrus recurred after approximately three weeks and again at six weeks, when the heifer was served and became pregnant, calving down in mid-February, 1943.

Cases 15 *and* 16.—Two Devon cows, each having bred three or four calves. The ovaries of each case were small and hypoplastic. Each received 20 mgm. of stilboestrol on February 19th, 1942, oestrus occurring on February 21st. Both became pregnant to service at the end of April, 1942.

Cases 17 *to* 21.—Five Devon-cross maiden heifers which had never shown oestrus. Each received 10 mgm. stilboestrol on February 19th, 1942. Three showed oestrus within 48 hours, recurring at approximately three-week intervals, and during May, 1942, cases 17, 18 and 19 were served successfully, calving during the early part of February, 1943.

Cases 20 and 21 showed no signs of oestrus following the injection.

Case 22.—Devon cow, one calf in December, 1941. Examination on March 9th, 1942, revealed a small corpus luteum in the right ovary, the cow being non-pregnant. The corpus luteum was left *in situ*. 20 mgm. of stilboestrol were given at this date, producing oestrus three days later, which recurred after about three weeks. The animal was then sold and no further observations were possible.

Case 23.—Devon cow, one calf, in November, 1941. Examination on March 10th, 1942, revealed a corpus luteum in the left ovary. This was extruded per rectum by digital pressure without producing oestrus. On March 17th, 1942, 20 mgm. stilboestrol were given, which produced oestrus two days later. This recurred in about three weeks, when service resulted in pregnancy.

Cases 24 *and* 25.—Two maiden Devon heifers which had never displayed oestrus. They received 15 mgm. of stilboestrol each on March 18th, 1942. The exact dates of oestrus were not recorded, but regular oestral cycles occurred in both cases. One is known to be pregnant.

Case 26.—Guernsey cow, fourth calf in December, 1941. Examination revealed a few small cysts in the left ovary, which were ruptured by digital pressure per rectum on March 4th, 1942, without result. On April 4th, 1942, 15 mgm. of stilboestrol were given, producing oestrus on April 6th; the cow was served at the first oestral period and was not again observed in oestrus. Re-examination on May 25th, 1942, showed a corpus luteum in the right ovary with slight enlargement of the right horn, and a tentative diagnosis of pregnancy was correct.

Case 27.—Devon cow, sixth calf in December, 1941. Examination showed small hypoplastic ovaries, and 20 mgm. of stilboestrol on April 4th, 1942, produced oestrus on April 6th. Subsequent observations were not recorded, but on August 6th, 1942, a positive pregnancy diagnosis was made.

Case 28.—Cross-bred maiden heifer. 15 mgm. of stilboestrol on April 14th, 1942, produced no oestrus, and the animal was disposed of before further observations could be made.

Case 29.—Devon cow, fifth calf in January, 1942. Examination on April 29th, 1942, revealed what appeared to be a corpus luteum in each ovary, and 20 mgm. of stilboestrol were given without producing oestrus. On May 25th, 1942, the corpora lutea were no longer palpable, and a further 20 mgm. of stilboestrol were given, again without inducing oestrus.

Case 30.—Devon cow, history unknown, but multigravida.

Examination revealed a corpus luteum in the left ovary which was extruded per rectum on August 25th, 1942, without producing oestrus. On October 26th, 1942, 20 mgm. of stilboestrol produced oestrus eight days later, with recurrence at three-weekly intervals.

Summary	Heifers	Cows	Total
No. of cases treated	18	12	30
,, showing recurrent oestrus ...	8 (44%)	11 (92%)	19 (63%)
,, becoming pregnant	6 (33%)	9 (75%)	15 (50%)

Discussion

In 63 per cent. of all cases oestrus was observed at regular intervals after injection of stilboestrol, thus supporting the view that the drug is capable of causing ovulation and the subsequent commencement of the normal ovarian cycle (see case 14).

From case 22 it appears that stilboestrol is also capable of causing regression of a persistent corpus luteum, and as cases 23 and 30 show that a corpus luteum may sometimes be extruded without bringing about oestrus, it would appear to be more rational to administer stilboestrol in these cases than to extrude the corpus luteum by physical force.

Possibly the most interesting fact that emerges is that stilboestrol treatment was more than doubly successful in the cow than in the maiden heifer. It appears probable that nutritional disorders are responsible for many of the cases of anoestrus in heifers which do not respond to stilboestrol therapy.

Conclusions

The results would appear to justify the use of stilboestrol dipropionate as a routine measure in the treatment of anoestrus, more particularly in cows, especially having regard to its low cost.

More experimental evidence is needed to ascertain whether smaller does would be equally effective.

ANNOTATION

Leptospiral Infections

Leptospiral jaundice (Weil's disease) has long been recognised in man and the infecting spirochaete *Leptospira icterohaemorrhagiae* has been demonstrated in all five continents. Weil's disease, however, is not the only form of leptospirosis and diseases have been described which are related to it and caused by other leptospirae. Animals, too, may suffer from leptospirosis and the persistence and spread of some of the diseases are through their agency. Thus, the reservoirs of *Lept. icterohaemorrhagiae* are rats, and field mice, *Mus norvegicus, Mus rattus alexandrinus* and *Microtus montebelloi*, whilst the reservoir of *Lept. canicola* is the dog.

The forms of leptospirosis in man can be classified into several clinical groups. In the first group there are mild types of disease such as "mud fever" and the Pomona or seven-day fever of Australia caused by *Lept. grippotyphosa* and *Lept. pomona* respectively. There is a connection between the first disease and floods, but none between Pomona disease, mud and water. The second clinical group includes infection with *Lept. canicola* and this usually causes neither jaundice nor death; the source of infection is the dog, the only known carrier. The third group consists of diseases caused by types of leptospirae known as Rachmat, Salinem, Swart van Tienen and Andaman A. These infections occur in Sumatra, Batavia, Macassar and Borneo; some are associated with rats and in some the carrier is unknown. Jaundice may occur and there are some deaths. The fourth group consists of Hasami fever caused by *Lept. autumnalis* and endemic in Nagasaki during the autumn and leptospirosis icterohaemorrhagia or true Weil's disease. In both conditions jaundice is frequent; the animal reservoir in the former is *Apodemus speciosus* and there is a fatality rate of 1·9 per cent., whereas in true Weil's disease this rate may be as high as 30 per cent. Weil's disease is mainly an occupational hazard and the risk of infection with *Lept. icterohaemorrhagiae* appears to be highest in persons whose work brings them into contact with water which is subject to pollution with rat urine.

Substantial clinical differences, therefore, exist between the various forms of leptospirosis and there are epidemiological differences and different animal reservoirs. The leptospirae responsible also differ in their serological properties and in their degrees of virulence for guinea-pigs. From the aspect of animal pathology two types of infection are important, those caused by *Lept. icterohaemorrhagiae* and *Lept. canicola*.

Okell, Dalling and Pugh (1925) gave an account of leptospiral jaundice as it occurred in the dog in this country and from three of ten cases they isolated leptospirae which agreed in every respect with a known rat strain of *Leptospira icterohaemorrhagiae*. They pointed out that up to 30 per cent. of the adult rats in many areas both in England and abroad harbour virulent leptospirae in their kidneys and excrete them in their urine. In human outbreaks of Weil's disease a close relationship between man and rat can nearly always be established and they believed that the disease in dogs was caused mainly by contamination of food and bedding with urine of carrier rats. Complete but temporary protection against the disease could be induced by the injection of potent anti-leptospira serum. It was shown later (Walch-Sorgdrager, 1939) that all strains of leptospirae cultivated from dogs were not identical, for Klarenbeek and Schüffner working in Holland had found a strain which was reacted upon by its own antiserum to a titre of 1:10,000, whereas with a serum prepared against *Lept. icterohaemorrhagiae* the titre was 1:25. The new strain known as *Lept. canicola*, is morphologically identical with *Lept. icterohaemorrhagiae* and can be cultivated in the same medium. Serologically and in its action on guinea-pigs it is different and it does not occur in rats. Its recovery has been recorded in Holland, Germany, Denmark and California.

Okell, Dalling and Pugh described two clinical forms of leptospirosis in the dog, (*a*) the hyperacute haemorrhagic type with a sudden onset and a rapid course, and (*b*) the icteric type in which the rapidity of the onset varies and there is jaundice of varying

degree. Meyer, Stewart-Anderson and Eddie (1939) describe this latter form as the typical Weil's disease or "yellows" in which the conjunctivae are coppery red in colour and the tongue and gums of the mouth are covered by yellowish crusts and erosions. *Post-mortem*, the liver may or may not be enlarged and is pulpy and clay coloured; the portal lymph nodes are sprinkled with haemorrhages. The pleural and peritoneal linings show petechiae and both the intestinal and respiratory tracts are injected. Another clinical type showing haemorrhagic gastro-enteritis with little or no icterus resembles canine typhus or Stuttgart disease and is referred to as a haemorrhagic type by these American workers. There is marked dehydration and the mouth and anal openings are soiled. The mucosa of the buccal cavity is dry and covered with diphtheritic deposits, and ulcers are present on the tongue and margin of the lips. The viscera are dark and the mucosa of the stomach, duodenum, colon and rectum is infiltrated and dark coloured. The liver is mottled and hyperaemic. Hyperaemia and streaking of the renal medulla is always apparent and the kidneys are slightly enlarged, and soft. The onset is sudden in both the icteric and haemorrhagic types of disease and the temperature is high; in the haemorrhagic or canine typhus type there is often a marked drop in the temperature on the second day and this is accompanied by anorexia, a marked thirst and occasionally by persistent vomiting. This type is seen predominantly in adult dogs and may be confused with "black tongue," from which it may be differentiated by its rapid onset, the vomiting and great depression early in the disease.

A chronic form of leptospirosis predominantly characterised by a nephritis, a high non-protein-nitrogen content of the blood and uraemia has been recognised in Holland.

In the acute forms there is an incubation period of about five to seven days and a spirochaetaemia. This is followed by a rapid clearing of the blood stream with a reinvasion of the blood and the formation of antibodies. As the antibodies increase more organisms are removed from the blood and become localised in the liver, kidneys, spleen, cardiac muscle and bone marrow. Jaundice is apparent in some cases and leptospirae are present in the urine towards the first week of illness and in non-fatal cases they are excreted for about two to four weeks. The kidney is probably the most important organ for diagnostic purposes and advantage can be taken of the development of antibodies, for they increase rapidly in animals that recover and remain at a significant titre for not less than a year. (Gray, 1942.)

Leptospirae in the living state may be studied with dark background illumination and they assume the appearance of bright filaments with fine spirals throughout their length giving serrated outlines. The ends are pointed and frequently curved and they are actively motile. Leptospirae may also be studied in films treated with Leishman and Giemsa stains and by Fontana's silver nitrate method. Various procedures of tissue impregnation with silver nitrate are also used and these have the advantage of conveying an idea of the numbers and distribution of the organisms in the tissues. Growth may be obtained in media containing a high percentage of blood or serum, the optimum temperature being from 30 to 37° C. The medium commonly used is that of Schüffner or a modification and contains 8 to 10 per cent. sterile rabbit serum. In a suitable natural environment pathogenic leptospirae may remain alive for months. (Buchanan, G., 1927.)

Direct culture is often not satisfactory and recourse is made to the use of guinea-pigs. Meyer *et al.* use guinea-pigs of 50 to 100 grammes weight and employ the intraperitoneal route. Emulsions of kidney and liver are injected and passaged through three to five series of animals. After the third or fourth passage the guinea-pigs lose weight and when killed show congested viscera, injected lymph glands and distended gall bladders. Gray (1942) uses guinea-pigs of 100 to 150 grammes and if there is any risk of the inoculum being contaminated then it may be applied to the depilated abraded skin of the abdomen. The taking of morning and evening temperatures gives an early and often the sole indication of infection, especially with primary inoculation of suspected tissues, and the organism may be virulent only after passage through two or three guinea-pigs.

Agglutinins, lysins and complement fixing antibodies appear towards the end of the first week of disease increasing to a high level within five to eight weeks. They persist for many months and then decline over a period of one to three years. If living leptospirae are brought into contact with an active serum then both agglutination and lysis may occur, whereas if the leptospirae are formalinised agglutination occurs and lysis is slight. These reactions may be observed under a dark background and a test of this kind is now commonly used. The complement fixation and adhesion tests require a number of reagents and offer no advantage. (Meyer *et al.*) Serological tests are useful for purposes of diagnosis and identification of the leptospirae and although cross reactions may occur there is usually a sufficient difference to detect the type of infection or the type of organism.

Coffin and Stubbs (1942) point out that if accurate diagnosis is to be made then laboratory procedures must be employed and those available are: (1) dark background examination of blood, urine and tissue juices; (2) study of specially stained tissue sections; (3) guinea-pig inoculations; (4) serological procedure; (5) cultural studies.

Some of these methods are impracticable as routine measures and they adopted as a serological test the microscopic agglutination test, using living suspensions of leptospira as antigens. Because animals once affected may possess significant serological titres years after the symptoms have subsided they considered an animal to be infective only if it showed: (*a*) typical or atypical symptoms with a rising titre or (*b*) typical or atypical symptoms with a positive culture.

Some of the positive cases dealt with by these authors were also examined for a change in their blood picture and all showed a neutrophile leucocytosis. There was no difference between the symptoms and lesions of the icteric cases due to *Lept. canicola* and the active cases of *Lept. icterohaemorrhagiae* infection. They see no basis for the idea that there is a different symptomatology for the two infections.

Epidemiologically there is, however, a wide difference, for with *Lept. icterohaemorrhagiae* the reservoir of infection is the rat, whereas not only has *Lept. canicola* not been found in rats, but it has so far been found impossible to make the rat a carrier. (Walch-Sorgdrager, 1939.) In *Lept. canicola* infection there is a host to host infection aided by uncleanliness and contact with the urine of clinical, convalescent and chronic cases.

There is little doubt that *Lept. canicola* is commoner than *Lept. icterohaemorrhagiae* in dogs though the difference varies throughout the world. In Holland (Klarenbeek, 1938) there is a record of 94 cases of *Lept. canicola* and 57 of *Lept. icterohaemorrhagiae* infection. Of the former 8 per cent. were in dogs under one year of age, 3 per cent. were jaundiced and 41 per cent. were fatal. In the latter 20 per cent. were under one year, 82 per cent. were jaundiced and 51 per cent. were fatal. In U.S.A. Meyer *et al.* investigated 88 cases of canine leptospirosis and all of the dog strains of leptospirae which were examined were *Lept. canicola*. Of the 88 cases studied 41 presented jaundice in varying degrees. Coffin and Stubbs (1942) diagnosed 15 cases in Philadelphia, 13 of which were caused by *Lept. canicola* and two by *Lept. icterohaemorrhagiae*. Gray (1942) has recovered *Lept. icterohaemorrhagiae* from four cases in Australia, where the isolation of *Lept. canicola* has not been recorded. Serological tests of samples of dog sera present a similar distribution. Meyer *et al.* found 16 of 47 dogs from San Francisco, four of 28 dogs from Santa Rosa and 13 of 111 dogs from New York City to possess antibodies for leptospirae. Van der Walle (1939) examined 100 dogs in Antwerp and was able to demonstrate leptospira infection in 44. The percentage infected apparently increased with age and *Lept. canicola* was found in a proportion of about two to one of *Lept. icterohaemorrhagia*. Raven (1941) tested 105 sera from dogs in rural communities of Pennsylvania and 50 from dogs in Philadelphia by the agglutination lysis reaction. Of these 38 per cent. of the former and 28 per cent. of the latter were positive either against *Lept. canicola* or *Lept. icterohaemorrhagiae*. A greater number were positive and had higher titres for the former than the latter. Greene (1941) demonstrated antibodies against *Lept. canicola* in the sera of from 19·4 to 46·7 per cent. of dogs in Southern California and none in 100 sera from cats; one sample of cat serum agglutinated *Lept. icterohaemorrhagiae* to a titre of 1:90. Coffin and Stubbs showed that 20 of 105 city and suburban dogs brought to the veterinary hospital of the University of Pennsylvania reacted and only one of 49 hounds. In 86 per cent. of the positive cases the reaction was stronger with *Lept. canicola*.

The incidence of latent infection of the rat with *Lept. icterohaemorrhagiae* is well documented and evidence has been adduced by direct observation of leptospirae, animal inoculation and serological tests. Buchanan (1927) examined 166 wild rats in Scotland and 61 were shown to be infected; other observers have recorded similar findings in other countries. Schüffner (1941) examined tame rats and finding about 40 per cent. infected, has emphasised the danger to which workers who handle rats are exposed. The presence of wounds on the hands is important and human volunteers were immunised with killed cultures of leptospirae.

The interest in canine leptospirosis throughout the world is largely due to the fact that *Lept. canicola* as well as *Lept. icterohaemorrhagiae* may infect man. The latter type is well known as a human pathogen and although commonly spread through the agency of rats and mice there are on record four human cases of true leptospiral jaundice due to *Lept. icterohaemorrhagiae* transmitted directly by dogs. (Petersen and Jacobsen, 1937.) So far 22 human infections with *Lept. canicola* have been recorded (Raven, 1941), 12 in Holland, one in Austria, six in Denmark, two in California and one in Copenhagen. Of the 12 reported from Holland none died and four showed meningitic symptoms. Severe

symptoms were not always recorded and jaundice hardly ever, although there was evidence of bile pigments in the blood serum. The serious renal symptoms and uraemic conditions so typical in dogs were not found in the human cases. Most of the patients had a dog and in several cases the dog was ill and in six of the cases the dog was shown to be infected with *Lept. canicola.* Often dogs were slightly sick and no veterinary surgeon was called in (Walch-Sorgdrager, 1939). Van der Walle (1939) records the recovery of *Lept. canicola* from the kidneys of a six-year-old fox-hound which had been regarded as healthy. There is at present no record of the isolation of *Lept. canicola* in this country.

R. Lovell.

References

Buchanan, G. (1927.) *Spec. Rep. Ser. med. Res. Comm.*, **113.**
Coffin, D. L., & Stubbs, E. L. (1942.) *Univ. Pa. Bull.*, **42** (No. 87), 3.
Gray, D. F. (1942.) *Aust. vet. J.*, **18**, 2.
Greene, M. R. (1941.) *Amer. J. Hyg.*, Sect. B., **34**, 87.
Klarenbeek, A. (1938.) *Zbl. Bakt.*, **142**, 83.
Meyer, K. F., Stewart-Anderson, B., & Eddie, B. (1939.) *J. Amer. vet. med. Ass.*, **95**, 710.
Okell, C. C., Dalling, T., & Pugh, L. P. (1925.) *Vet. J.*, **81**, 3.
Petersen, C. B., & Jacobsen, E. (1937.) *C.R. Soc. Biol.*, **126**, 797.
Raven, C. (1941.) *J. infect. Dis.*, **69**, 131.
Schüffner, W. (1941.) *Z. Immun Forsch.*, **99**, 323.
Van der Walle, N. (1939.) *Ned. Tijdschr. Geneesk*, **83**, 740.
Walch-Sorgdrager, B. (1939.) *Bull. Health Organisation (League of Nations)*, **8**, 143.

IN PARLIAMENT

"Tuberculin Tested Milk in the Common Pot"

In the course of last week's debate in the House of Lords on the subject of milk distribution, the public health aspect was introduced by Lord Perry who, remarking that on his farm he was paid a premium of 3½d. above the normal price for tuberculin-tested milk, commented: "What happens to this milk? It is tipped into the common pot, together with all the other dirty milk produced by less competent people. I am paid a premium by the Government authority to produce clean milk, and when I have done it it is tipped into the common pot with the dirtiest milk possible. That is a piece of bad management on the part of the Ministry, and it is an outrage on the consumer."

Lord Geddes challenged the Minister to deny Lord Perry's accusation that clean, tuberculin-tested milk was being mixed with milk infected with bovine tuberculosis in Government milk depots. If that was true he thought it should be stated that our children's milk was being deliberately contaminated by the Government.

Lord Woolton interposed: "I am sure Lord Geddes will not expect me to say that the Government is engaged in deliberately contaminating children's milk." He would welcome the opportunity of making a statement on the subject at an early date. "I will go further," he added, "and say at once that I am not at all satisfied with the present position." T.T. milk that could find a market was being sold as T.T. milk. The T.T. milk that could not find a market was being mixed with other milk. Lord Geddes was clearly taking too pessimistic a view when he suggested that all other milk, as it went to the children, contained all those germs.

Questions

Water Supplies (Cattle)

Sir Reginald Clarry asked the Minister of Agriculture whether, in view of the importance of ensuring that a supply of clean uninfected water is made available to cattle, he will consider extending the assistance at present given to farmers to local authorities in rural districts so as to enable them, if necessary, to put in hand water schemes which cannot be financed out of rates or revenue?

The Minister of Agriculture (Mr. R. S. Hudson): I cannot undertake to introduce legislation extending grant-aid by my Department to local authorities who are water undertakers to put in hand new schemes of water supply. The grants made at present to farmers in aid of capital expenditure incurred by them in obtaining a supply are available whether or not the water is obtained from a local authority.

Diseased Cattle (Removal)

Sir R. Clarry asked the Minister of Agriculture whether he will take steps to ensure that the Order prohibiting the removal of cattle infected with tuberculosis in a clinical form from farm premises to an open market is rigidly enforced; and whether he will extend this Order to include cattle suffering from contagious abortion?

Mr. Hudson: All practical steps are taken to ensure that cattle infected with tuberculosis in a clinical form are not removed from farm premises to a market. With regard to the latter part of the Question, the exposure in a market of a cow which has calved prematurely within the preceding two months is prohibited by the Epizootic Abortion Order of 1922.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

April 12th.—N.V.M.A. Drafting Committee on Sheep Diseases, Royal Station Hotel, York, 3.30 p.m.

April 13th.—N.V.M.A. Survey Committee, Royal Station Hotel, York, 2.30 p.m.

April 14th—15th.—**R.C.V.S. Committee and Council Meetings,** Royal Station Hotel, York.

April 16th.—Special "Open" Meeting of the Southern Counties Division, N.V.M.A., at the Guildhall, Winchester, to consider increased, cleaner and safer milk production, 2.30 p.m. Short business meeting at the Southgate Hotel, Winchester, 12 noon.

April 17th.—Meeting of the Association of Veterinary Inspectors, B.M.A. House, Tavistock Square, London, W.C.1, 2 p.m.

April 21st.—Special Meeting of the Scottish Branch, N.V.M.A., at Glasgow, to discuss the Draft Bill, R.C.V.S., 2.30 p.m.

April 22nd.—Annual General Meeting of the Mid-West Division, N.V.M.A., at Bristol, 2.30 p.m.

April 22nd.—Annual General Meeting of the Eastern Counties Division, N.V.M.A., at Norwich, 11 a.m.

April 28th.—Annual General Meeting of the Western Counties Division, N.V.M.A., at Exeter, 2 p.m.

April 29th.—N.V.M.A. Joint Veterinary Officers and Public Health and Parliamentary Committee, 36, Gordon Square, W.C.1, 11.30 a.m.

April 29th.—Meeting of the Midland Counties Division, N.V.M.A., at Birmingham, 2.30 p.m.

April 30th.—**N.V.M.A. Council Meeting,** Connaught Rooms, Great Queen Street, W.C.2, 11.30 a.m.

May 6th.—Meeting of the Central Veterinary Society, Conway Hall, Red Lion Square, W.C.1, 2.30 p.m.

* * * * *

PERSONAL

Mr. Hames's 70th Anniversary of Graduation

All our readers will wish to be associated with the congratulations sent by the Registrar of the Royal College to Mr. Samuel Laxton Hames, of Somerby, Oakham, Rutland, who on April 1st celebrated the 70th anniversary of his graduation as a member of the College. Mr. Hames's graduation in 1873 was from the London College, and we are glad to learn that, except for arthritis in one leg, our venerable friend enjoys excellent health. With the passing of Mr. James Webb in October of last year, Mr. Hames acquired the honourable title of "Father of the Profession. Next on the list of *Chirurgorum Veterinariorum Collegii Regii Seniores* is Mr. Wm. Anderson, J.P., of Keith, Banff, who graduated in 1874.

Mr. George Gibson's Tribute

Dr. Bullock, on notifying Mr. Hames's friend and fellow townman, Mr. George Gibson, of this notable anniversary, received the following reply, dated April 1st:—

"I was pleased to receive your letter informing me that Mr. S. Hames celebrated the 70th anniversary as a member of the College to-day.

"He is an old friend of my family and myself, and it was a great pleasure to call and congratulate him on behalf of the profession. He is in very good health and sends his best wishes to all members of the profession.

"Although Sam Hames, as he is universally known, practised very little, he has met more members of the profession than most people. He started his College life in London, under Professor Spooner and later Professor Simons, and he said that it was during his student days that the Chair for Biology was founded. After graduating in 1873, Mr. Hames saw practice in Oundle and with Shave at Chelmsford, but after twelve months he gave up practising and joined his father, who had a big business as a dealer in hunters in Leicester, where he stayed until 1914, when the business was moved to Somerby, Melton Mowbray. During his 70 years of horse-dealing, hundreds and hundreds of veterinary surgeons have visited his stables examining hunters for their clients, and it was not an unusual thing to see three veterinary surgeons from various parts of England in his yard on the same day.

"Mr. Hames was a great horseman and one of the finest men to hounds of his day. He has always been a kind and courteous British sportsman, with that happy knack of saying the right thing at the right time. I am sure the veterinary profession, as a whole, and especially all those practitioners who had the pleasure of meeting him, will wish Mr. Hames the best of health, and trust that he may remain the 'Father of the Profession' for a long time to come."

* * * * *

THE LATE MR. HARRY YEOMANS, M.R.C.V.S.

An Appreciation

Mr. James Robertson, of Wolverhampton, writes:—

By the passing of Mr. Harry Yeomans, M.R.C.V.S., of Handsworth, Birmingham (whose death was reported in last week's *Veterinary Record*), the Midlands has lost one of its most practical and respected veterinary surgeons whose services were highly valued by a large clientele, as expressed by the number of letters received by Mrs. Yeomans.

Mr. Yeomans qualified at the Royal (Dick) Veterinary College, Edinburgh, on May 21st, 1903, and was my first locum tenens in that year. His first practice was at Chepstow, where he remained till 1909, when he went to Kidderminster. He sold this practice to Mr. Stevens in 1913—I eventually bought it for my late son, who successfully carried it on until the time of his lamented death in 1939—and removed to Smethwick, and in 1933 he went to Handsworth Wood.

Mr. Yeomans was a large breeder of Sealyhams and wire-haired fox terriers, but Sealyhams were his favourites, and of these he was one of the best judges in the Midlands.

He was the son of a Herefordshire farmer, and being brought up "animal minded"—and this is the great secret of a successful practitioner—he loved his work and made it his hobby. He was a good judge of a Shire horse and well known in the horse world. In cases of canker of the horse's foot, those who knew him intimately might have classed him as a specialist, for what he did not know about canker wasn't worth knowing. He was a Freemason, being a member of the "Loyal Hay" Lodge, No. 2381, Chepstow.

The funeral took place on Friday, April 2nd. The service was at St. Mary's Parish Church, Handsworth, and was beautifully conducted by Bishop Linton. The interment was at Uplands Cemetery. Amongst the many mourners the veterinary profession was well represented: Mr. Allan, F.R.C.V.S., of the Birmingham Corporation (President, Midland Veterinary Society); Capt. Howard Dawes, M.R.C.V.S., West Bromwich (Secretary); Mr. Griffiths, M.R.C.V.S., Moseley, Birmingham; Major DeVine, F.R.C.V.S., Birmingham Corporation; Mr. Stewart, M.R.C.V.S., Handsworth (assistant); Mr. Garden, M.R.C.V.S., Sutton Coldfield; Capt. James Robertson, M.R.C.V.S., Tettenhall, Wolverhampton, and Mr. Garden, jun., Sutton Coldfield, and Mr. McLaren, of Liverpool (both final year veterinary students). The floral tributes were many and beautiful.

* * * * *

REGISTER OF VETERINARY SURGEONS, 1943

The Register for 1943 has just been published. It will be sent free of charge to any member who asks for a copy on payment of his annual fee to the College. Owing to paper shortage it has not been possible to print a sufficient number for every member to have a copy.

The work has been in the Press since the end of December, 1942, and in the interval a number of changes of address have occurred, so that the Register cannot be absolutely accurate and up to date, but late corrections have been included wherever possible.

The volume contains the lists of officers of the College, the By-laws, etc., and a reprint of the Annual Report for the year ended March 31st, 1942. Complete lists are given of Officers of the Royal Army Veterinary Corps, the Ministries of Agriculture, the staffs of the Veterinary Colleges and Research Institutes, Officers in Municipal and Colonial Veterinary Services, etc., and a new feature is a list of Veterinary Investigation Officers.

The total number of members on the Register is 4,123. This is the first time that the figure 4,000 has been exceeded. The number of new graduates admitted in 1942 was 223, and the number of deaths recorded 81.

* * * * *

COCOA AND CHOCOLATE RESIDUES, INCLUDING COCOA SHELL, FOR STOCK FEEDING

In a joint announcement the Ministries of Agriculture and Food state: Experience has shown that cocoa and chocolate residues, including cocoa shell, are suitable for feeding to adult cattle whether dairy or fattening, provided that the daily ration does not contain more than 2 lb. of this material. Some authorities say that milk is improved when cocoa shell or husk (which contains a small quantity of vitamin D) is fed to dairy cattle, since the vitamin D content of the milk is thereby raised.

This does not mean, however, that cocoa and chocolate residues, including cocoa shell, are suitable feeding-stuffs for other classes of livestock. In fact, in the case of pigs, poultry and calves, they are definitely detrimental and the cumulative effect of the consumption of even limited quantities of these residues by these kinds of stock may be serious.

It has therefore been decided that these cocoa residues should be sold only (1) to licensed manufacturers of cattle foods for inclusion to the extent of 2½ per cent. in National Cattle Food No. 1a for feeding to adult cattle, or (2) direct to stock keepers by the manufacturers of the residues or their accredited agents. When sold direct to stock keepers, each consignment must be accompanied by a warning that the material is not fit for feeding to calves, pigs or poultry and that, in the case of adult cattle, the quantity of 2 lb. per day should not be exceeded.

* * * * *

CO-OPERATIVE SYSTEMS IN EUROPEAN AGRICULTURE

British Association Conference

The British Association, through its Division for the Social and International Relations of Science, is arranging a conference on Co-operative Systems in European Agriculture, to be held on Friday and Saturday, April 16th and 17th, at the Royal Institute of International Affairs, Chatham House, St. James's Square, S.W.1, by kind permission of the Institute. The conference will be opened by Sir Richard Gregory, BT., F.R.S., President of the Association, and there will be four sessions, the subjects of which will be co-operation in three groups of European countries (north, west and east), and immediate relief after the war. A list of speakers and other particulars, together with tickets of admission, are obtainable from the British Association, Burlington House, London, W.1.

The Association, in arranging this conference, is continuing its policy of dealing, by this and other methods, with subjects of especial importance in relation to post-war reconstruction, which were touched upon in the course of the conference on Science and World Order, held in September, 1941. Among recent conferences, reference may be made here to that on European Agriculture: Scientific Problems in Post-war Reconstruction (March, 1942), the transactions of which were published in the Association's Report, *The Advancement of Science*, vol. II, No. 6, price 5s.

* * * * *

"AGRICULTURAL SCIENCE" IN SCHOOLS

Veterinarians will join with agriculturalists in welcoming the news from the Board of Education that, in future, every school which takes the Oxford and Cambridge School certificate will have the opportunity of making Agricultural Science optional in the list of subjects.

"This concession on the part of the Oxford and Cambridge Joint Boards," says *The Farmer and Stock Breeder*, "is due to no concerted action on the part of teachers, or the agricultural industry, but to an individual appeal from the enterprising headmaster of a Gloucestershire grammar school. He asked for farm science to be recognised as a subject for examination. His wish has been granted, and in the forthcoming summer examinations it will, at last, be possible for agriculture to take its place as a subject of rank. There will be two examinations of one and a half hours each, according to an official of the Board. Soils, manures, crops, stock and pests are included in the syllabus."

* * * * *

H.M. STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office.

	Price net s. d.	*Post free* s. d.
Health, Ministry of:		
Phosphatase Test for Heat Treated Milk. Laboratory Technique. (Addendum to Memo. 139/Foods). March, 1943	0 1	0 2
Statutory Rules and Orders, 1943:		
E.P.474. Railways. Transport of Horses (Amendment) Direction, March 25th ...	0 1	0 2

CONTROL OF DISEASES OF DAIRY CATTLE

STATEMENT SHOWING THE NUMBER OF UNDERTAKINGS NOTIFIED TO THE MINISTRY OF AGRICULTURE DURING THE MONTH OF MARCH, 1943

County	Undertakings Notified		Total Undertakings		
	During Month	Previously	Number	Number of Cattle	
				Cows	Heifers
ENGLAND AND WALES					
Bedford	2	32	34	747	486
Berks	5	70	75	2,788	1,900
Bucks	3	53	56	1,496	1,068
Cambridge ..	1	15	16	361	147
Chester	6	344	350	11,612	4,016
Cornwall	2	6	8	154	103
Cumberland ..	3	39	42	1,071	895
Derby	14	230	244	7,331	4,151
Devon	6	130	136	2,306	1,325
Dorset	5	53	58	1,861	984
Durham	7	215	222	5,239	1,773
Essex	19	191	210	7,756	4,366
Gloucester	2	74	76	2,434	1,283
Hampshire	25	286	311	9,218	5,733
Hereford	2	24	26	441	251
Hertford	3	59	62	2,064	1,232
Hunts	3	10	13	469	306
Isle of Ely	—	1	1	1	8
Isle of Wight ..	1	15	16	310	148
Kent	7	109	116	2,567	1,360
Lancs	10	171	181	5,138	1,512
Leics	4	73	77	2,037	1,381
Lincs (Holland) ..	—	4	4	45	11
Lincs (Kesteven) ..	—	19	19	233	120
Lincs (Lindsey) ..	2	67	69	1,370	669
Middlesex	—	11	11	507	224
Norfolk	6	155	161	4,875	3,096
Northants	—	63	63	1,724	1,186
Northumberland ..	2	48	50	1,608	769
Notts	3	104	107	2,541	1,364
Oxford	2	31	33	958	883
Rutland	1	8	9	157	109
Salop	9	207	216	6,806	3,260
Soke of Peterborough	—	1	1	37	31
Somerset	17	131	148	4,117	1,802
Staffs	13	161	174	5,082	2,655
Suffolk E.	5	74	79	1,920	1,361
Suffolk, W. ..	1	40	41	916	556
Surrey	1	103	104	2,955	1,332
Sussex, E.	7	154	161	4,270	2,403
Sussex, W.	8	96	104	2,802	1,701
Warwick	3	104	107	2,770	1,703
Westmorland ..	1	17	18	499	568
Wilts	—	65	65	2,933	1,372
Worcester	5	124	129	2,804	1,375
Yorks, E.R. ..	3	68	71	1,141	598
Yorks, N.R. ..	7	90	97	1,999	1,180
Yorks, W.R. ..	15	219	234	5,865	2,151
Anglesey	2	33	35	613	383
Brecon	—	3	3	50	22
Caernarvon ..	1	102	103	1,722	861
Cardigan	5	16	21	300	238
Carmarthen ..	2	178	180	3,343	1,664
Denbigh	—	51	51	1,037	533
Flint	3	92	95	2,113	923
Glamorgan	3	71	74	1,211	438
Merioneth	—	10	10	123	82
Monmouth	1	36	37	853	525
Montgomery ..	—	13	13	239	169
Pembroke	5	80	85	1,568	959
Radnor	—	—	—	—	—
TOTALS	263	5,049	5,312	141,507	73,704
SCOTLAND					
Aberdeen	1	25	24	1,094	333
Angus	—	17	17	659	232
Argyll	—	4	4	73	78
Ayr	4	42	46	1,660	1,391
Banff	—	2	2	103	20
Berwick	—	1	1	33	22
Bute	—	—	—	—	—
Caithness	—	—	—	—	—
Clackmannan ..	—	4	4	123	98
Dumfries	1	16	17	911	727
Dumbarton	—	3	3	105	86
East Lothian ..	—	7	7	191	100
Fife	—	22	22	848	524
Inverness	2	7	9	291	186
Kincardine	1	3	4	215	111
Kinross	—	3	3	68	29
Kirkcudbright ..	1	14	15	918	716
Lanark	1	17	18	634	493
Midlothian	—	1	1	44	69
Moray	—	—	—	—	—
Nairn	—	1	1	14	—
Orkney	—	—	—	—	—
Peebles	—	4	4	67	39
Perth	3	21	24	614	336
Renfrew	—	9	9	384	297
Ross-shire	—	4	4	128	72
Roxburgh	—	—	—	—	—
Selkirk	—	—	—	—	—
Stirling	1	26	27	819	591
Sutherland	—	3	3	77	61
West Lothian ..	—	2	2	99	70
Wigtown	—	29	29	2,056	1,141
Zetland	—	—	—	—	—
TOTALS	15	285	300	12,228	7,822

Note.—Of the total 5,312 undertakings notified to date, 1,408 are for 1 year, 344 are for 2 years, and 3,560 are for 3 years.

Duration of Undertakings: 1 year, 77; 2 years, 29; 3 years, 194.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Monday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal views of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

* * * * *

VETERINARY SURGEONS ACTS (AMENDMENT) BILL

Sir,—In considering the draft of the new Veterinary Bill, the first and most obvious question to be asked is, "What does the Bill propose to do?"

Close scrutiny of the Bill shows that its proposals are:—

For the Quack who applies to be Registered — Clause 2 proposes to afford him official status and cover by the R.C.V.S.
Clause 5 proposes to give him power to recover in Court fees for services rendered, on the same footing and with the same powers as a qualified M.R.C.V.S.

For the Qualified M.R.C.V.S. — The Bill has only one proposal, *i.e.*, to increase the amount of his annual subscription to the R.C.V.S. from £1 1s. to anything up to £5 5s.

For the Quack who does not apply to be Registered — The Bill leaves this gentleman to his own sweet will, to carry on gaily as heretofore, in that the definition of "First Aid" is so wide that it takes the power out of Clause 1, as any treatment of a sick animal could be claimed to be for the purpose of saving its life or alleviating suffering.

The Bill would, in my opinion, so obviously strengthen the hand of the quack or of those employing same, that it comes as a thunderbolt to find that the Bill is being sponsored, not by some unofficial quack organisation, but by the Royal College of Veterinary Surgeons! Why should the official governing and protecting body of the profession fortuitously go out of its way to strengthen the hands of those inimical to the best interests of the profession and of the public?

In further detail, the Bill is, I contend, definitely bad in the following points:—

(*a*) Clause 1 (3) (*b*) allows farmers, etc., to perform "Any" operations, etc., which is a word of very wide implications. Had the word "common" or some equivalent word been added, it would have been safer. The Preamble to the Bill does include the word "common," but it is not the Preamble that counts—it is the Bill itself.

(*b*) The Preamble states in para. 4 that the Bill "does not give them any other privileges." How does this compare with Clause 5 of the Bill which does propose to give the privilege of power to recover in Court fees, etc.?

(*c*) The proposed establishment of an Official Register, by the R.C.V.S., of quacks, is astounding, particularly in view of the fact that admission to the Register is to be voluntary and not compulsory. I would suggest that quacks be allowed to register with the police or any one else they like, if they wish, but I feel that admission to any Official Register of the R.C.V.S. will place in the hands of the quack a ready-made title and authority which he will most certainly not omit to parade, almost in fact tantamount to a "colourable resemblance" of the qualified man's title. Do the sponsors of the Bill fondly imagine that the proposed title "Registered Animal Practitioner" will be clearly differentiated by the ordinary farmer or dog-owner, or that the bearer of such title will take pains to emphasise that difference? I feel that, by the ordinary client, a registered animal practitioner and a veterinary practitioner will be regarded as one and the same.

In conclusion, I feel that the Bill does nothing for the qualified M.R.C.V.S. except to increase his annual subscription that it does strengthen the position of those quacks who apply for admission to the proposed Register, that it does not in any practical manner restrict the activities of such quacks as do not apply for registration, and that it is a Bill which most certainly should be rejected by the members of the veterinary profession.

Yours faithfully,

Hillhead,
143, King's Gate,
Aberdeen.
March 24th, 1943.

JOHN M. McDONALD.

* * * * *

SULPHANILAMIDE AND THE SURVEY SCHEME

Sir,—With regard to sulphanilamide and the Survey Scheme, cases have come to our notice in which this drug is being used for purposes other than those for which it was originally intended.

Clients during the last few years have been educated to the value of this drug and some of them, under the Survey Scheme, now go to their veterinary surgeon for a quantity of it without the veterinary surgeon seeing the case for which it was intended; in fact the veterinary surgeon supplies it on the farmer's diagnosis.

Thus it is not only being used for all types of mastitis, but also for pneumonia, chills and wound treatment, and we have even heard of it being used for the treatment of wooden tongue. The fact that some farmers use sulphanilamide for every type of mastitis makes the percentage of cures low, giving the farmer a very poor opinion of the Survey Scheme, while its use for other purposes amounts to the waste of a very valuable drug which is being supplied by the Government.

If the Survey Scheme is to increase in popularity then it must become essential for the veterinary surgeon to see every case before issuing drugs.

Yours faithfully,

Renwick House, T. J. Patterson.
Shepton Mallet, H. Williams Smith.
Somerset.
March 31st, 1943.

* * * * *

SULPHONAMIDES IN VETERINARY PRACTICE

Sir,—In reply to Mr. Hamilton Kirk's queries, the answer to the first is that it is the "vulnerability" of the host to sulphaguanidine which is responsible for the statement that this product is of no value in the treatment of coccidiosis in rabbits. not a difference of "vulnerability" of the respective intestinal parasites of rabbits and birds. The rabbit absorbs some sulphaguanidine and acetylates practically all that is absorbed, with fatal results.

As recorded by Miss Joshua in your issue of March 27th, however, she has experimented with this product and has elaborated a system of dosage which she considers safe and of value in treatment. This information will be of great interest to those who have the opportunity of trying it out in practice.

In regard to sulphadiazine, I presume Mr. Kirk has not consulted all the "manufacturers"—if he has done so I am indeed lost, because it was on information received from a well-known laboratory worker in a very large manufacturing firm of the highest standing, that the statement was made; I believe it is consistent with at least a proportion of American opinion. This difference of opinion may possibly be commented upon by others with more precise knowledge of this preparation, its toxity and activity, to the benefit of those interested.

Mr. Kirk then disputes the assertion that sulphanilamide is a specific for *streptococcus equi*. First of all, we must be quite clear as to what we mean by the word "specific" when applied to a drug. According to my medical dictionary a "specific" is one which has a distinct curative influence on a particular disease, for example, quinine in malaria. A drug described as a specific may be used empirically. My clinical experience, which is reasonably wide, leads me to describe sulphanilamide as a specific in the treatment of strangles. The fact that I reiterated the need for rational local treatment, including the local treatment of abscesses where they were present, has apparently been responsible for this query. Mr. Kirk presumes that all my cases are reported before adenitis or actual abscess formation has occurred.

We must not delude ourselves with the belief that any sulphonamide can disperse pus. It is, I believe, accepted that these products are inactive when bacteria are in a medium consisting of pus. Where pus exists rational local treatment is essential.

My records show horses which had, in fact, had abscess formation, returning to work in 14 days—they also show a far greater number of "in contact" cases, diagnosed early by careful supervision once the initial case or cases had occurred, which received sulphanilamide directly symptoms were shown (slowing up in work, loss of appetite, slight serous nasal discharge, occasional cough and temperature) returning to light work in periods of less than seven days. This return to work has been necessitated by shortage of transport and to date has not resulted in any untoward sequelae. The total number of horses involved in different outbreaks is about 60.

The word "specific" as applied to sulphonamides in the treatment of infectious enteritis and feline influenza or distemper is not so well deserved; nevertheless, my experience, which was supported by Mid-West practitioners in the discussion following my address, is that sulphanilamide and sulphapyridine have a distinct curative influence on these two diseases provided they are administered during the early stages, before the patient is moribund, and adequate attention is given to hygienic measures, nursing and local treatment.

I am glad to find Mr. Kirk in agreement that these two diseases are separate entities and very surprised to find him under the impression that he has been rather alone in that belief. As far as I am aware, this opinion is widespread among clinicians who find no undue difficulty in differential diagnosis.

In supporting my contention that endless confusion has arisen regarding the nomenclature of sulphonamides, he misses the real point; it is not the complexity of names and chemical formulae that has been responsible, but the introduction of special trade names by different manufacturers for the same product.

I would point out, in conclusion, that the address to the Mid-West was a somewhat hurriedly compiled *opening of a discussion* and was not intended to be a comprehensive paper on the sulphonamide group of drugs. The clinical uses indicated are backed by "full and lengthy" trial and observation in my own practice and were not intended to "stampede" any practitioner into "hurried and erroneous beliefs."

Yours faithfully,

"Rockholme," G. N. Gould.
12, Landguard Road,
Southampton.
March 25th, 1943.

* * * * *

THE HEDGEHOG SUCKLING THEORY

Sir,—It is very doubtful if hedgehogs ever suck milk from the teats of cows, although I have evidence that they may mutilate teats for an entirely different reason. One has only to study the dentition of the animal to appreciate that suckling would be quickly resisted by the cow.

The theory probably originated in the fact that the male hedgehog possesses remarkably large seminal vesicles and if post-mortemed or crushed by a car wheel during the breeding season a considerable quantity of seminal fluid escapes from the abdomen, white in colour, which might easily be mistaken for milk.

Some years ago, I was called in to one farm, frequently, to attend "incised" teats. The wounds were invariably parallel and longitudinal, one on either side of the teat. Hedgehogs were particularly plentiful on the premises. On one occasion, the farmer himself went out at daybreak during the summer to bring in the cows. One of these rose from the ground with an adult hedgehog hanging by its teeth to the front right teat. She immediately kicked the intruder with her hind foot, flinging the animal some distance away, where it promptly rolled up and was killed by the farmer.

The teat was slit from end to end in two parallel lines, but the milk duct was not penetrated. I made a *post-mortem* examination of the hedgehog, but failed to find milk in the stomach.

It seems probable that the animal, being mainly insectivorous (though omnivorous when it lives in the neighbourhood of the waste pails of a country town), searches for slugs in the dewy grass. It is likely that its discrimination between a damp teat and a juicy slug may sometimes be at fault.

Yours faithfully,

Vean House, R. H. Smythe.
Camborne.
March 27th, 1943.

* * * * *

CEREBRO-SPINAL EUTHANASIA IN THE DOG

Sir,—Regarding Mr. Geffen's query in last week's *Record*, we regret the error in our letter. The injection is, of course, made through the foramen magnum and not through the obturator foramen.

Yours faithfully,

Bath. F. B. Hardy and J. Storey.
April 4th, 1943.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Parasitic Mange*	Sheep Scab	Swine Fever
March 1st to 15th, 1943 ...	18	1	1	10	17
Corresponding period in—					
1942 ...	11	1	4	7	14
1941 ...	24	38	1	5	66
1940 ...	25	2	—	8	131
Total Jan. 1st to Mar. 15, 1943	76	10	3	74	103
Corresponding period in—					
1942 ...	67	11	13	87	87
1941 ...	112	115	5	79	506
1940 ...	129	14	8	82	789

Note.—The figures for the current year are approximate only.
* Excluding outbreaks in Army Horses.